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(54) PROCESS FOR THE MANUFACTURING OF A DECORATIVE THERMO-SETTING PLASTIC LAMINATE

VERFAHREN ZUR HERSTELLUNG EINES DEKORATIVEN WÄRMEHÄRTBARENKUNSSTOFFVERBUNDMATERIALS

PROCEDE DE FABRICATION D'UN STRATIFIE PLASTIQUE DECORATIF THERMODURCISSABLE

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Description

[0001] The present invention relates to a process for the manufacturing of a decorative thermosetting laminate with an abrasion and scratch resistant surface layer.

[0002] Decorative thermosetting laminates are well known and used for instance as surface material for walls, cupboard doors, desktops, tabletops, for other furniture and as a flooring material.

[0003] Such laminates are often made of two to seven Kraft paper sheets impregnated with phenol-formaldehyde resin, a monochromatic or patterned decor paper sheet impregnated with melamine-formaldehyde resin and a fine so called overlay, sheet of α-cellulose impregnated with melamine-formaldehyde resin.

[0004] The overlay sheet is intended to protect the decor paper sheet from abrasion. In certain cases the overlay sheet is omitted.

[0005] There are also laminates consisting of a base layer of particle board or fibre board provided with such a decor paper sheet and optionally an overlay sheet. These sheets can be laminated to the base layer under heat and pressure. If only a decor paper sheet is used then this can be glued to the base layer.

[0006] The described laminates do have many good properties, it has however turned out that there is a great need of improving the abrasion resistance and the surface scratch resistance of laminates exposed to an extreme abrasion. This is especially the case for flooring laminates, but to a certain extent also for desktop and tabletop laminates.

[0007] According to the U.S. patent 4,940,503 the abrasion resistance of such laminates has successfully been improved. Then a paper web is impregnated with melamine-formaldehyde resin. At least one side of the web is coated with small dry and hard particles with an average particle size of about 1-80 µm, evenly distributed over the wet resin surface on the web whereafter the resin is dried. The particle coated web, so called prepreg is thereafter optionallycut into sheets. At least one such sheet or web is placed as a surface layer on a base layer and bonded thereto. The hereby produced laminate will have a good abrasion resistance.

[0008] The hard particles used according to the invention normally have an average particle size of around 50 µm, which is an advantage from an abrasion point of view. It has, however turned out that the scratch resistance of laminates produced in the known way is not always satisfactory. Furthermore the press plates used during the laminating stage are scratched by the relatively big particles in the surface of the laminate. The press plates are very expensive and manufactured of a high quality steel. Intermediate layers of disposable aluminium foil are often used to protect these press plates which will affect the production cost.

[0009] US 5,362,557 discloses a decorative laminate comprising at least one backing layer sheet and a melamine-formaldehyde resin impregnated decorative paper sheet laminated thereto, said decorative paper sheet having thereon a coating comprising mineral particles having a particle size of about 3 microns and mineral particles having a particle size of about 25 microns, both of which are present in a concentration sufficient to provide for abrasion resistance, the ratio of the larger particles to the smaller particles being 2:1, said abrasion resistance mineral particles being applied concurrently with said melamine-formaldehyde resin to said decorative paper sheet to simultaneously coat and impregnate said decorative sheet; a coupling agent; a thickening agent in an amount sufficient to suspend said mineral particles; and a lubricating agent in a concentration sufficient to provide for scrape resistance.

[0010] EP 0 519 242 A1 discloses a damage resistance decorative laminate, which is said to have improved scratch, mark, scrape and abrasion resistance comprising at least one backing layer sheet and a thermosetting resin impregnated decorative paper sheet laminated thereto, said decorative paper sheet having thereon an abrasion resistance coating comprising a mixture of a coated abrasion resistant mineral particle having a particle size of about 15 to about 45 microns in a concentration sufficient to provide for abrasion resistance; a thickening agent in an amount sufficient to suspend said abrasion resistance mineral particles; and a lubricating agent in a concentration sufficient to provide for scrape resistance.

[0011] However, these decorative laminates are not satisfactory with regard to their scratch resistance.

[0012] There is a need to be able to produce an abrasion and scratch resistant decorative laminate and to avoid the above mentioned problems.

[0013] It has according to the present invention been possible to achieve a process for the manufacturing of a decorative thermosetting laminate with an abrasion and scratch resistant surface layer, which laminate comprises paper sheets impregnated with thermosetting resin. The process is characterised in that a continuous paper web is impregnated with melamine-formaldehyde resin, that one side of the web is coated with 2-20 g/m^2, preferably 6-12 g/m^2 of hard particles with an average particle size of 30-90 µm, preferably 40-70 µm. The particles are evenly distributed over the whole wet resin surface of the paper web, after which the resin is dried. The other side of the web, or a second paper web is coated with a melamine-formaldehyde resin, where the resin contains hard particles with an average particle size of 1-15 µm, preferably 1-9 µm and in such an amount that the web will have a coating of 1-15 g/m^2, preferably 2-10 g/m^2 of these hard particles, whereafter the resin is dried. The particle-coated impregnated paper web, so called prepreg is optionally cut into sheets. At least one such sheet or web is placed as a surface layer on an base layer and bonded thereto whereby the surface coated with the smallest particles is placed so that it is directed towards

the upper side of the laminate and the surface with the bigger particles is directed downwards. Alternatively the first sheet or web with the smallest particles is placed as the uppermost layer in the laminate with the particle coated side directed towards the upper side of the laminate and the second sheet or web with the bigger particles is placed under the uppermost layer with the particle-coated surface directed outwards.

[0014] The hard particles can consist of many different materials. Especially suitable materials are silicon dioxide, aluminium oxide, and/or silicon-carbide. A blend of two or more materials is accordingly also possible.

[0015] The base layer can consist of a fibre-board or a particle-board, whereby the particle coated paper sheet is bonded to the base layer by laminating under heat and pressure or by gluing. The base layer can also consist of a number of conventional dry pre-preg webs or prepreg sheets respectively which are not coated with particles. The particle coated web or sheet respectively is placed on' top of these conventional webs or sheets, whereby the resin in the uppermost of these webs respectively sheets normally consists of melamine-formaldehyde resin, while the rest of the webs respectively sheets preferably contains phenol-formaldehyde resin or phenol-urea- formaldehyde resin, whereafter the webs respectively a stack of sheets continuously respectively discontinuously are laminated together with the surface layer by using a high pressure and an increased temperature.

[0016] The particle coated paper web or paper sheet often consists of a so-called overlay paper, preferably of α-cellulose

[0017] It is, however also possible to coat the so-called decorative sheet with the hard particles. The decorative sheet can be patterned or monochromatic

[0018] In some cases it is possible to coat the overlay sheet as well as the decorative sheet with particles or use two ore more particle coated overlay sheets or decorative sheets. It is also possible to place a conventional not particle coated overlay sheet on top of the particle coated sheet or sheets

[0019] The invention will be explained further in connection to the embodiment examples below, of which the examples 1 - 7 illustrates a first embodiment of the invention where the uppermost sheet in the laminate consists of a so-called overlay on the top side coated with a slurry of melamine-formaldehyde resin containing small hard particles, and on the lower side coated with somewhat larger particles in the still wet melamine-formaldehyde resin which the paper has been impregnated with.

[0020] Example 8 represents a prior art laminate for comparison, which laminate was made in accordance with the U S. patent 4,940,503 where the uppermost sheet in the laminate has been coated with rather big particles on the lower side in still wet melamine-formaldehyde resin which the paper has been impregnated with

[0021] Examples 9 and 10 represent another embodiment of the invention where the uppermost sheet in the laminate is coated with a slurry of melamine-formaldehyde resin containing small hard particles The lower side of this uppermost sheet is not coated with any particles instead somewhat bigger particles have been sprinkled on the still wet resin on the top side of the second uppermost melamine-formaldehyde resin impregnated paper sheet

[0022] Example 11 represents a comparison test outside the scope of the invention. The uppermost sheet in the laminate consists of an overlay which on the top side has been coated with a slurry of melamine-formaldehyde resin containing small hard particles The lower side of this paper sheet is not coated with any bigger hard particles, nor is there any second underlying sheet coated with bigger hard particles.

[0023] From the examples 1 - 7 and 9 and 10 according to the invention is it shown that a very good scratch resistance is achieved by the use of the small hard particles on the upper side of the uppermost sheet. The somewhat bigger particles on the lower side of the uppermost sheet or on the top side of the following sheet give a very good abrasion resistance

[0024] The comparative test according to example 8 shows that a good abrasion resistance is achieved when bigger hard particles are used on the lower side of the uppermost sheet The scratch resistance will however be rather poor.

[0025] The comparative test according to example 11 shows that a good scratch resistance is achieved when small hard particles is used on the top side of the uppermost sheet. The abrasion resistance will however be very poor if the bigger particles are left out on the lower side of the uppermost paper or on underlying paper

[0026] The examples show the measured scratch resistance, measured by means of two different methods according to a modified version of ASTM D-2197. At the first method the sample is judged in a viewing cupboard at an eye - sample distance of 772 - 914 mm and at an observation angle between 45 and 75 degrees from the table surface. The sample is judged according a classification scale This first method is called distance.

[0027] The second method is made in the same way. The person who makes the test does however decide the angle and the distance himself so that the real scratch becomes visible. This second method is called real. A low value indicates the best scratch resistance

[0028] In the examples the scratch resistance has only been measured by scratching across the manufacturing direction of the laminate (paper), since a scratch becomes more visible in this direction. Sometimes also the scratch resistance along the laminate is measured.

[0029] The abrasion was in the examples measured according to EN 438-2:6

[0030] According to this standard the abrasion through the decorative layer of the finished laminates is measured in

two steps In the first step the so-called IP (initial-point) is measured, where the initial abrasion starts

[0031] In step two the so called EP (end-point) is measured, where 95% of the decor is worn through.

[0032] Additionally the standard prescribes that the number of revolutions achieved with the testing machine in steps one and two are added and that the obtained sum is divided by 2. Hereby the 50% point for abrasion is obtained, which normally is the figure reported in standards and offprints

[0033] In this and the following examples however only the IP is used.

Example 1

[0034]

a) One roll of so called overlay paper of α-cellulose with a surface weight of 25 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 57% by weight, calculated on dry impregnated paper The top side of the wet paper web was sprinkled with aluminium oxide particles to an amount of 8 g/m^2 The particles had an average size of 50 µm The particles were applied by using an apparatus as described in the U S. patent 4,940,503

The particle coated paper web was then continuously fed into a heating oven, where the solvent was evaporated while the resin cured to a so-called B-stage. The moisture content of the paper was after the drying 10% by weight The other, not sprinkled side of the paper web was coated with a slurry of melamine-formaldehyde resin containing aluminium oxide particles to an amount of 5.3% by weight. The average size of the particles was 1 µm

The paper web was then continuously dried in an oven until the moisture content of the paper was 7% by weight

The final resin content of the completely impregnated paper was 70% by weight calculated as dry impregnated paper, and the total amount of added aluminium oxide particles was 8 + 2.7 g/m^2

The paper web was cut into sheets of a suitable length

b) One roll of so called overlay paper of α-cellulose with a surface weight of 25 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 70% by weight, calculated on dry impregnated paper. The top side of the wet paper web was sprinkled with aluminium oxide particles to an amount of 7 g/m^2 by using the same apparatus as in a) above. The particles were of an average size of 50 µm. The paper web was then dried to a moisture content of 7% by weight. The paper web was cut into sheets of the same length as in a) above.

c) One roll of so called decor paper with a surface weight of 100 g/m^2 was impregnated with a solution of melamine-formaldehyde resin to a resin content of 46% by weight, calculated on dry impregnated paper. The impregnated paper web was dried to a moisture content of 4% by weight.

The paper web was cut into sheets of the same length as in a) and b) above.

d) One roll of Kraft paper with a surface weight of 170 g/m^2 was impregnated with a phenol-formaldehyde resin solution to a resin content of 28% by weight, calculated on dry impregnated paper. The wet paper web was dried to a final moisture content of 7% by weight. The paper web was cut into sheets of the same length as above.

[0035] The impregnated paper sheets as described in a) - d) above were placed between two press plates in the following order; one paper a) with the side with the smallest particles oriented outwards, one paper b) with the sprinkled side oriented outwards, one paper c) and three papers d). Together the last mentioned papers. so-called base sheets, formed a base layer in the laminate which was manufactured by pressing of the sheets in a conventional multi-opening press during 80 minutes and at a pressure of 85 x 10^5 Pa (bar).

[0036] The properties of the manufactured laminate were as follows:

Abrasion	16100 revolutions
Scratch resistance	across / 4 (distance), across / 9 (real)

Example 2

[0037] The procedure according to example I was repeated with the difference that the melamine-formaldehyde slurry in step a) contained aluminium oxide particles with an average size of 3 µm instead of 1 µm.

[0038] The properties of the manufactured laminate were as follows:

Abrasion	14050 revolutions

(continued)

Scratch resistance	across / 3 (distance), across / 3 (real)

Example 3

[0039] The procedure according to example I was repeated with the difference that the melamine-formaldehyde slurry in step a) contained 10 6% by weight of aluminium oxide particles instead of 5.3% by weight Additionally the aluminium oxide particles had an average size of 5 µm instead of 1 µm. The total amount of particles was 8 + 5 4 g/m^2

[0040] The properties of the manufactured laminate were as follows:

Abrasion	15500 revolutions
Scratch resistance	cross / 1 (distance), cross / 7 (real)

Example 4

[0041] The procedure according to example 3 was repeated with the difference that the melamine-formaldehyde slurry in step a) contained 15 9% by weight of aluminium oxide particles instead of 10 6% by weight Also in this example the aluminium oxide panicles had an average size of 5 µm. The total amount of particles added was 8 + 8.1 g/m^2

[0042] The properties of the manufactured laminate were as follows,

Abrasion	14200 revolutions
Scratch resistance	across / 1 (distance), across / 1 (real)

Example 5

[0043] The procedure according to example 1 was repeated with the difference that the melamine-formaldehyde slurry in step a) contained aluminium oxide particles with an average size of 9 µm instead of 1 µm

[0044] The properties of the manufactured laminate were as follows:

Abrasion	15100 revolutions
Scratch resistance	across / 3 (distance), across / 3 (real)

Example 6

[0045]

a) One roll of so called overlay paper of α-cellulose with a surface weight of 25 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 57% by weight, calculated on dry impregnated paper. The top side of the wet paper web was sprinkled with aluminium oxide particles to an amount of 9 g/m^2 The particles were of an average size of 50 µm. The particles were applied by using an apparatus as described in the U.S. patent 4,940,503

The particle sprinkled paper web was then continuously feed into a heating oven, where the solvent was evaporated while the resin cured to a so-called B-stage. The moisture content of the paper was after drying 10% by weight.

The other, not sprinkled side of the paper web was coated with a slurry of melamine-formaldehyde containing aluminium oxide particles to an amount of 10 6% by weight The average size of the particles was 3 µm.

The paper web was then continuously dried in an oven until the moisture content of the paper was 7% by weight

The final resin content in the completely impregnated paper was 72% by weight calculated as dry impregnated paper, and the total amount of added aluminium oxide particles was 9 + 5 4 g/m^2.

b) One roll of so-called overlay paper of α-cellulose with a surface weight of 25 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 72% by weight, calculated on dry impregnated paper. The paper web was then dried to a moisture content of 7% by weight.

c) One roll of so called decor paper with a surface weight of 100 g/m^2 was impregnated with a melamine-formal-

dehyde resin solution to a resin content of 46% by weight, calculated on dry impregnated paper. The impregnated paper web was dried to a moisture content of 4% by weight

d) One roll of Kraft paper with a surface weight of 150 g/m^2 was impregnated with a phenol-formaldehyde resin solution to a resin content of 36% by weight, calculated on dry impregnated paper. The wet paper web was dried to a moisture content of 7% by weight.

[0046] The impregnated paper webs as described in a) - d) above were continuously feed in between the two press bands of a continuous press in the following order; one paper a) with the side with the smallest particles oriented outwards, one paper b), one paper c) and three papers d).

[0047] The pressing cycle lasted for 20 seconds and the pressure was 35 x 10^5 Pa (bar) laminate was then cut into suitable lengths.

[0048] The properties of the manufactured laminate were as follows:

Abrasion	13900 revolutions
Scratch resistance	across / 3 (distance), across / 5 (real)

Example 7

[0049] The procedure according to example 6 was repeated with the difference that the slurry of melamine-formaldehyde resin in step a) contained aluminium oxide particles to an amount of 5.3% by weight instead of 10.6% by weight. The average size of the particles was 1 µm instead of 3 µm. The total amount of added aluminium oxide particles was 9 + 2.7 g/m^2.

[0050] The properties of the manufactured laminate were as follows:

Abrasion	13900 revolutions
Scratch resistance	across / 5 (distance), across / 7 (real)

Example 8 (comparative)

[0051]

a) One roll of so-called overlay paper of α-cellulose with a surface weight of 25 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 70% by weight, calculated on dry impregnated paper. The top side of the wet paper web was sprinkled with aluminium oxide particles to an amount of 8 g/m^2. The particles were of an average size of 50 µm. The paper web was then continuously dried in a heating oven to a moisture content of 7% by weight. The other side of the paper was left untreated and was therefore not coated with any hard particles The paper web was cut into sheets of a suitable length.

[0052] Step b), c) and d) were repeated according to example 1

[0053] The impregnated paper sheets according to a) - d) above were placed between two press plates in the following order; one paper a) with the particle side oriented downwards, one paper b) with the sprinkled side oriented outwards, one paper c) and three papers d). The pressing was conducted in the same way as in example 1.

[0054] The properties of the manufactured laminate were as follows:

Abrasion	13550 revolutions
Scratch resistance	across / 31 (distance), across / 41 (real)

Example 9

[0055]

a) One roll of so-called overlay paper of α-cellulose with a surface weight of 25 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 50% by weight, calculated on dry impregnated paper. The paper web was then dried to a moisture content of 7.2% by weight.

One side of the paper was coated with a slurry of a solution of melamine-formaldehyde resin containing alu-

minium oxide particles to an amount of 5 0% by weight. The average size of the particles was 3 μm.

The paper web was then continuously dried in an oven until the moisture content in the paper was 8.6% by weight

The final resin content of the completely impregnated paper was 70% by weight calculated on dry impregnated paper, and the total amount of added aluminium oxide particles was 3 3 g/m^2

The paper web was cut into sheets of a suitable length.

b) One roll of patterned decor paper of α-cellulose with a surface weight of 38 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 50% by weight, calculated on dry impregnated paper. The top side of the wet paper web was sprinkled with aluminium oxide particles to an amount of 9.5 g/m^2 by using the same apparatus as in a) above. The particles were of an average size of 50 μm. The paper web was then dried to a moisture content of 6.7% by weight. The paper web was cut into sheets of the same length as in a) above.

c) One roll of monochromatic decor paper with a surface weight of 100 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 54% by weight, calculated on dry impregnated paper. The impregnated paper web was dried to a moisture content of 6.5% by weight.

The paper web was cut into sheets of the same length as in a) and b) above.

d) One roll of Kraft paper with a surface weight of 170 g/m^2 was impregnated with a phenol-formaldehyde resin solution to a resin content of 28% by weight, calculated on dry impregnated paper. The wet paper web was dried to a final moisture content of 7% by weight. The paper web was cut into.sheets of the same length as above.

[0056] The impregnated paper sheets as described in a) - d) above were placed between two press plates in the following order; one paper a) with the particle coated side oriented outwards, three paper b) with the sprinkled side oriented outwards, one paper c) and three papers d). Together the last mentioned papers, so called base sheets, formed a base layer of the laminate which was manufactured by pressing the sheets in a conventional multi-opening press during 80 minutes and at a pressure of of 85 x 10^5 Pa (bar).

[0057] The properties of the manufactured laminate were as follows:

Abrasion	26100 revolutions
Scratch resistance	across / 1 (distance), across / 9 (real)

Example 10

[0058]

a) One roll of patterned decor paper of α-cellulose with a surface weight of 41 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 41% by weight, calculated on dry impregnated paper. The paper web was then dried to a moisture content of 6.7% by weight. One side of the paper web was then coated with a slurry of melamine-formaldehyde resin containing aluminium oxide particles to an amount of 5% by weight. The particles had an average size of 3 μm.

The paper web was then continuously dried in an oven until the moisture content of the paper was 7.4% by weight.

The final resin content of the completely impregnated paper was 63% by weight calculated on dry impregnated paper, and the total amount of added aluminium oxide particles was 3.3 g/m^2.

The paper web was cut into sheets of a suitable length.

b) One roll of patterned decor paper of α-cellulose with a surface weight of 41 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 49% by weight, calculated on dry impregnated paper. The top side of the wet paper web was sprinkled with aluminium oxide particles to an amount of 9.5 g/m^2. The particles were of an average size of 50 μm. The paper web was then dried to a moisture content of 7% by weight. The paper web was cut into sheets of the same length as in a) above.

[0059] The steps c) and d) according to example 9 were repeated and a laminate was manufacture in the same way as in example 9

[0060] The impregnated paper sheets as described in a) - d) above were placed in the following order; one paper a) with the particle coated side oriented outwards, three papers b) with the sprinkled side oriented outwards, one paper

c) and three papers d).

[0061] The properties of the manufactured laminate were as follows,

Abrasion	27100 revolutions
Scratch resistance	across / 5 (distance), across / 9 (real)

Example 11 (comparative)

[0062]

a) One roll of so-called overlay paper of α-cellulose with a surface weight of 25 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 50% by weight, calculated on dry impregnated paper.

The paper web was then continuously dried in a heating oven. The moisture content in the paper, was after drying 10% by weight.

One side of the paper web was coated with a slurry of a solution of melamine-formaldehyde resin containing aluminium oxide particles to an amount of 5.0% by weight. The average size of the particles was 3μm.

The paper web was then continuously dried in an oven until the moisture content of the paper was 7% by weight.

The final resin content in the completely impregnated paper was 70% by weight calculated on dry impregnated paper, and the total amount of added aluminium oxide particles was 3.3 g/m^2.

The paper web was cut into sheets of a suitable length.

b) One roll of so-called decor paper with a surface weight of 100 g/m^2 was impregnated with a melamine-formaldehyde resin solution to a resin content of 46% by weight, calculated on dry impregnated paper. The paper web was then dried to a moisture content of 4% by weight.

The paper web was cut into sheets of the same length as in a) above.

c) One roll of Kraft paper with a surface weight of 170 g/m^2 was impregnated with a phenol-formaldehyde resin solution to a resin content of 28% by weight, calculated on dry impregnated paper. The wet paper web was dried to a moisture content of 7% by weight. The paper web was cut into sheets of the same length as above.

[0063] The impregnated paper sheets as described in a) - c) above were placed between two press plates in the following order one paper a) with the particle coated side oriented outwards, one paper b) and three papers c). Together the three last mentioned papers, so called base sheets formed a base layer of the laminate which was manufactured by pressing of the sheets in a conventional multi-opening press during 80 minutes and at a pressure of 85 x 10^5 Pa (bar).

[0064] The properties of the manufactured laminate were as follows:

Abrasion	200 revolutions
Scratch resistance	across / 5 (distance), across / 9 (real)

Claims

1. Process for manufacturing of a decorative thermosetting laminate with an abrasion resistant and a scratch resistant surface layer, which laminate comprises paper sheets impregnated with a thermosetting resin, **characterized in that** a continuous paper web is impregnated with melamine-formaldehyde resin, that one side of the web is coated with 2 to 20 g/m^2 of hard particles with an average particle size of 30 to 90 μm evenly distributed over the whole wet resin surface of the paper web, whereafter the resin is dried, that the other side of the paper web, or a second paper web is coated with a melamine-formaldehyde resin, where the resin contains hard particles having an average particle size of 1 to 15 μm, in such an amount that the web will have a surface coating of 1 to 15 g/m^2 of these hard particles, that the resin is dried, that the particle-coated impregnated paper web is optionally cut into sheets, that at least one such sheet or web is placed as a surface layer on a base layer and is bonded thereto whereby the surface coated with the smallest particles is placed so that it is directed towards the upper side of the laminate and the surface with the bigger particles is directed downwards, alternatively that the first sheet or web with the smallest particles is placed as the uppermost layer in the laminate with the particle-coated side directed towards the upper side of the laminate and that the second sheet or web with the bigger particles is placed under the uppermost layer with the particle-coated surface directed outwards.

2. Process according to claim 1, wherein the one side of the web is coated with 6 to 12 g/m^2 of hard particles.

3. Process according to claim 1 or 2, wherein the one side of the web is coated with hard particles with an average particle size of 40 to 70 µm.

4. Process according to any one of claims 1 to 3, wherein the resin coated on the other side of the paper web or a second paper web contains hard particles with an average particle size of 1 to 9 µm.

5. Process according to any one of claims 1 to 4, wherein the surface coating of the other side of the paper web or a second paper web is 2 to 10 g/m^2.

6. Process according to any one of claims 1 to 5 **characterized in that** the base layer consists of a number of conventional dry pre-preg webs or pre-preg sheets respectively which are not coated with particles, that the particle coated web or sheet respectively is placed on top of these conventional webs or sheets, whereby the resin in the uppermost of these webs or sheets respectively optionally consists of melamine-formaldehyde resin, while the rest of the webs or sheets respectively contains phenol-formaldehyde resin or phenol-urea-formaldehyde resin, whereafter the webs respectively a stack of sheets are continuously respectively discontinuously bonded to the surface layer by using a high pressure and an increased temperature.

7. Process according to any one of claims 1 to 5 **characterized in that** the base layer consists of a fibre-board or a particle-board.

8. Process according to any one of claims 1 to 7 **characterized in that** the particle coated paper web or paper sheet consists of a so-called overlay paper and/or a so-called decorative sheet, which can be patterned or monochromatic.

9. Process according to claim 8, wherein the so-called overlay paper consists of α-cellulose.

10. Process according to claim 7 **characterized in that** the particle-coated paper web or paper sheet is bonded to the base layer by gluing or laminating under heat and pressure.

11. Process according to any of claims 1 to 10 **characterized in that** the hard particles consist of silicon dioxide, aluminium dioxide, and/or silicon carbide.

12. Process according to any of claims 1 to 11 **characterized in that** the two particle-coated overlay sheets are used.

Patentansprüche

1. Verfahren zur Herstellung eines dekorativen wärmehärtbaren Laminats mit einer abriebfesten und kratzfesten Oberflächenschicht, wobei das Laminat Papierblätter umfasst, imprägniert mit einem wärmehärtbaren Harz, **dadurch gekennzeichnet, dass** ein kontinuierliches Papiergewebe mit Melamin-Formaldehyd-Harz imprägniert wird, dass eine Seite des Gewebes mit 2 bis 20 g/m^2 harter Teilchen mit einer durchschnittlichen Teilchengrösse von 30 bis 90 µm, gleichmässig verteilt über die gesamte feuchte Harzoberfläche des Papiergewebes, beschichtet wird, woraufhin das Harz getrocknet wird, dass die andere Seite des Papiergewebes oder ein zweites Papiergewebe mit einem Melamin-Formaldehyd-Harz, wobei das Harz harte Teilchen enthält, mit einer durchschnittlichen Teilchengrösse von 1 bis 15 µm in einer derartigen Menge beschichtet wird, dass das Gewebe eine Oberflächenbeschichtung von 1 bis 15 g/m^2 dieser harten Teilchen aufweist, dass das Harz getrocknet wird, dass das teilchenbeschichtete, imprägnierte Papiergewebe optional zu Blättern geschnitten wird, dass mindestens ein solches Blatt oder Gewebe als Oberflächenschicht auf eine Basisschicht platziert und damit verbunden wird, wodurch die mit den kleinsten Teilchen beschichtete Oberfläche so platziert wird, dass sie zur Oberseite des Laminats gerichtet ist, und dass die Oberfläche mit den grösseren Teilchen nach unten gerichtet ist, alternativ, dass das erste Blatt oder Gewebe mit den kleinsten Teilchen als oberste Schicht in dem Laminat platziert wird, wobei die teilchenbeschichtete Seite zur Oberseite des Laminats gerichtet ist, und dass das zweite Blatt oder Gewebe mit den grösseren Teilchen unter der obersten Schicht platziert wird, mit der teilchenbeschichteten Oberfläche nach aussen gerichtet.

2. Verfahren gemäss Anspruch 1, wobei die eine Seite des Gewebes mit 6 bis 12 g/m^2 harter Teilchen beschichtet ist.

3. Verfahren gemäss Anspruch 1 oder 2, wobei die eine Seite des Gewebes mit harten Teilchen mit einer durchschnittlichen Teilchengrösse von 40 bis 70 µm beschichtet ist.

4. Verfahren gemäss einem der Ansprüche 1 bis 3, wobei das Harz, beschichtet auf die andere Seite des Papiergewebes oder eines zweiten Papiergewebes, harte Teilchen mit einer durchschnittlichen Teilchengrösse von 1 bis 9 µm enthält.

5. Verfahren gemäss einem der Ansprüche 1 bis 4, wobei die Oberflächenbeschichtung der anderen Seite des Papiergewebes oder eines zweiten Papiergewebes 2 bis 10 g/m^2 aufweist.

6. Verfahren gemäss einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Basisschicht aus einer Anzahl von konventionellen trockenen Vorbeschichtungs (pre-preg)-Geweben bzw. Vorbeschichtungsblättern besteht, die nicht mit Teilchen beschichtet sind, dass das mit Teilchen beschichtete Gewebe bzw. Blatt auf die Oberseite dieser konventionellen Gewebe oder Blätter platziert wird, wobei das Harz in dem obersten dieser Gewebe bzw. Blätter optional aus einem Melamin-Formaldehyd-Harz besteht, während der Rest der Gewebe bzw. Blätter Phenol-Formaldehyd-Harz oder Phenol-Harnstoff-Formaldehyd-Harz enthält, woraufhin die Gewebe bzw. ein Stapel Blätter kontinuierlich bzw. diskontinulerlich mit der Oberflächenschicht unter Verwendung von Hochdruck und erhöhter Temperatur verbunden werden.

7. Verfahren gemäss einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Basisschicht aus Faserkarton oder einem Teilchenkarton besteht.

8. Verfahren gemäss einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** das mit Teilchen beschichtete Papiergewebe oder das Papierblatt aus einem sogenannten Deckschichtpapier und/oder einem sogenannten Dekorationsblatt besteht, das gemustert oder einfarbig sein kann.

9. Verfahren gemäss Anspruch 8, wobei das sogenannte Deckschichtungspapier aus α-Cellulose besteht.

10. Verfahren gemäss Anspruch 7, **dadurch gekennzeichnet, dass** das mit Teilchen beschichtete Papiergewebe oder Papierblatt mit der Basisschicht durch Kleben oder Laminierung unter Hitze und Druck verbunden wird.

11. Verfahren gemäss einem der Ansprüche 1 bis 10, **dadurch gekennzeichnet, dass** die harten Teilchen aus Siliciumdioxid, Aluminiumdioxid und/oder Siliciumcarbid bestehen.

12. Verfahren gemäss einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** die zwei teilchenbeschichteten Deckschichtpapiere verwendet werden.

Revendications

1. Procédé de fabrication d'un stratifié thermodurcissable décoratif comprenant une couche superficielle résistante à l'abrasion et résistante aux rayures, lequel stratifié comprend des feuilles de papier imprégnées d'une résine thermodurcissable, **caractérisé en ce qu'**une bande de papier continue est imprégnée d'une résine de mélamine-formaldéhyde, **en ce qu'**une face de la bande est revêtue de 2 à 20 g/m^2 de particules dures ayant une taille moyenne des particules de 30 à 90 µm distribuée de manière régulière sur la surface résinique humide totale de la bande de papier, après quoi la résine est séchée **en ce que** l'autre face de la bande de papier, ou une seconde bande de papier, est revêtue d'une résine de mélamine-formaldéhyde, où la résine contient des particules. dures ayant une taille moyenne des particules de 1 à 15 µm, en une quantité telle que la bande aura un revêtement de surface de 1 à 15 g/m^2 de ces particules dures, **en ce que** la résine est séchée, **en ce que** la bande de papier imprégnée revêtue de particules est facultativement découpée en feuilles, **en ce qu'**au moins une telle feuille ou bande est placée sous forme de couche superficielle sur une couche de base et lui est liée, avec pour effet que la surface revêtue des particules les plus petites est placée de sorte à être orientée vers la face supérieure du stratifié et que la surface portant les particules plus grandes est orientée vers le bas, **en ce que**, facultativement, la première feuille ou bande, portant les particules les plus petites, est placée sous forme de couche la plus supérieure dans le stratifié avec la face revêtue de particules orientée vers la face supérieure du stratifié et **en ce que** la seconde feuille ou bande portant les particules plus grandes est placée sous la couche la plus supérieure avec la surface revêtue de particules orientée vers l'extérieur.

2. Procédé selon la revendication 1, dans lequel une face de la bande est revêtue de 6 à 12 g/m^2 de particules dures.

3. Procédé selon la revendication 1 ou 2, dans lequel une face de la bande est revêtue de particules dures ayant une taille moyenne des particules 40 à 70 µm.

4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel la résine couchée sur l'autre face de la bande papier ou sur une seconde bande papier contient des particules dures ayant une taille moyenne des particules de 1 à 9 µm.

5. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel le revêtement superficiel de l'autre face de la bande de papier ou d'une seconde bande de papier est de 2 à 10 g/m^2.

6. Procédé selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** la couche de base est constituée d'un certain nombre de bandes pré-imprégnées ou de feuilles pré-imprégnées à l'état sec conventionnelles, respectivement, qui ne sont pas revêtues de particules, **en ce que** la bande ou la feuille revêtue de particules, respectivement, est placée au sommet de ces bandes ou feuilles conventionnelles, avec pour effet que la résine dans la partie la plus supérieure de ces bandes ou feuilles, respectivement, est facultativement constituée d'une résine de mélamine-formaldéhyde, tandis que le reste des bandes ou feuilles, respectivement, contient une résine phénol-formaldéhyde ou une résine phénol-urée-formaldéhyde, après quoi les bandes, respectivement, un empilage de feuilles, sont, en continu, respectivement, en discontinu, liées à la couche superficielle en utilisant une pression élevée et une température accrue.

7. Procédé selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** la couche de base est constituée d'un panneau de fibres ou d'un panneau de particules.

8. Procédé selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que** la bande de papier ou feuille de papier revêtue de particules, est constituée de ce que l'on appelle un papier overlay et/ou de ce que l'on appelle une feuille décorative, qui peuvent être à dessins ou monochrome.

9. Procédé selon la revendication 8, dans lequel ce que l'on appelle un papier overlay est constitué d'α-cellulose.

10. Procédé selon la revendication 7, **caractérisé en ce que** la bande de papier ou feuille de papier revêtue de particules est liée à la couche de base par collage ou par lamination sous chaleur et pression.

11. Procédé selon l'une quelconque des revendications 1 à 10, **caractérisé en ce que** les particules dures sont constituées de dioxyde de silicium, de dioxyde d'aluminium et/ou de carbure de silicium.

12. Procédé selon l'une quelconque des revendications 1 à 11, **caractérisé en ce que** les deux feuilles overlay revêtues de particules sont utilisées.